

VIEW to the U transcribed
Season 2, Women in Academia, Episode #10
Professor Tracy Rogers, Department of Anthropology (UofT),
Director, Forensic Science Program, U of T Mississauga

Bare Bones of Research

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Carla DeMarco (CD): **The Bare Bones of Research**

Just in time for Halloween and Day of the Day, we hear about the skeletons, bones, and forensic research that are guiding forces for today's guest on VIEW to the U.

On this edition of the podcast, Professor **Tracy Rogers** plots her research path that has led to her place as a forensic anthropologist at the University of Toronto Mississauga and as a consultant with the Ontario Forensic Pathology Service. She discusses her broad program of research that touches on several areas including identifying skeletal remains, analyzing bone composition and investigating skeletal health and also the importance of recognizing the practical applications of research.

With this second season of the podcast focused on women in academia, Tracy also talks about why forensic science is a particular draw for women and the importance of science outreach for youth.

Hello, and welcome to VIEW to the U, an eye on UTM research. I'm Carla DeMarco at U of T Mississauga. VIEW to the U is a monthly podcast that will feature UTM faculty members from a range of disciplines who will illuminate

some of the inner workings of the science labs and enlighten the social sciences and humanities hubs at UTM.

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CD: Tracy Rogers is an associate professor in the Department of Anthropology at the University of Toronto and the director of the Forensic Science Program at U of T Mississauga. Her research examines methods of estimating the age-at-death of an individual based on the skeleton, skeletal-sex determination, skeletal techniques for determining the ancestry of the deceased, and the identification of unidentified human remains. Based on her research expertise, she has been actively involved in case work since 1998 and has provided testimony for several high profile crime investigations in Ontario, Manitoba, and British Columbia.

CD: I know that your research interests cover several areas including the identification of unknown skeletal remains, and also things like factors that influence skeletal condition or health, but I was wondering if you could tease this out a bit further to give a more complete picture of your research and some of the projects that you're undertaking or have undertaken over the course of your academic career, and also very interested in the technologies that you employ to carry out your work. I should have stated this at the outset, but also keeping in mind that not everyone listening has a science background, so we keep the terminology, or if you mention something that's kind technical, explain it.

TR: My experience and background is in forensic anthropology, and in terms of understanding the identification of the skeleton, this means that we're interested in, when human remains are discovered, I want to know what is the age of this individual, the sex, the ancestry, any unusual conditions or medical conditions that a person may have that could be useful in identification. For that reason, my research focuses on those areas as well.

When I was doing my PhD, I was looking at ancestry assessment of the skeleton, and I was focusing on trying to be able to distinguish people of South Asian ancestry, so India, Pakistan, from people of European ancestry because the skeletons actually look fairly similar. But one of the problems that we would have is in Canada when people go missing, and especially at that time, it's a little bit different now, but at that time, they would go missing, and family would report them, and then the question would be, "Are they white or nonwhite?" The South Asian families would say nonwhite, but then when the skeleton was found, the skeleton would actually look more European, and we didn't have a way of defining South Asian.

Then they would be found, but the designation would be white, so you have a missing non-white person, and you have found white skeleton. This is not going to result in a match, so my research was focusing on trying to figure out how we

could resolve that and identify people correctly as being of South Asian ancestry so that that initial identification or possible identification gets made.

That analysis was actually just looking many different variants of the skeleton because the skeleton has all kinds of small differences depending on things like individual differences, differences between the sexes, and population differences. Things like whether certain vessels in the skull, let's say, go through an actual hole in the skull or it's just a notch, or there's different kinds of characteristics like that that we look for. That's the kind of thing that I was doing, and measurements of the bones as well.

Then when I continued on and was working here when I first started, I was looking at different methods of sex assessment, and I developed a method of sex assessment that looks at the elbow joint. This was, again, looking at the structure, the shape, and it was really focusing on the upper arm bone, the humerus, so that was one of the things that I was doing. Then I was looking to see whether it could be applied to teenagers and to children and at what age that feature's no longer, or suite of features no longer works. That was one of the things.

CD: You could tell the difference between the sexes based on the elbow joint?

TR: Yeah, so based on, it's called the distal humerus because it's at the far end of the humerus, closest at the elbow, and it's on the backside of it. The way that the humerus articulates or joins up with the ulna and the radius in the forearm, that angle that this produce there is result of different characteristics on the humerus, and you can tell. It's not a perfect correlation. It's about somewhere around 80% accurate, so it won't work for everybody, but it's helpful-

CD: Wow.

TR: ... in many cases.

Carla DeMarco: That's amazing.

TR: It's useful because you get forensic cases where there's been damage to the body, and then you cannot get maybe the bones that you would like to be able to look at for sex assess, like bones in the pelvis, they could be damaged for whatever reason, and therefore, having different areas of the body to be able to look and to be able to assess is really important.

Then most recently, I've been looking at age estimation and looking at elemental analysis of bones, so that's looking to see what the composition of the bone actually is, calcium, phosphorus, all of the different types of elements that get incorporated into bone, and I want to see what the relationship of the different percentages of those elements are depending on a person's age, sex, health, all sorts of different variables that could influence this to see if we could

use that for some of these assessments because, in many cases, we get fragmentary bones, so you can't even get complete joint surfaces to look at or very large sections of bone to measure. You end up with just tiny pieces, so we need techniques that can work for tiny pieces. It also helps us better understand what's going on in the skeleton as well and where in the skeleton certain elements are being absorbed and used and transferred and stored and all that sort of thing.

CD: I know you mentioned that you have a couple of grad students working with you in your lab. Could you talk a little bit about some of the projects that are coming from your lab?

TR: Right. A number of the students are working on similar areas, ancestry, sex, and age. The way that we're approaching this is from different directions. We tried to use different technologies. I have one student who's looking at ancestry, looking at the general shape characteristics like I was talking about, as well as the measurements, but then he's also looking at the DNA, so what is the DNA is saying about the ancestry and comparing to see how closely associated the skeletal features are with the DNA assessment of ancestry and population variation.

Then I have another grad students who's looking at ancestry, and she's specifically focusing on the femur, so the upper thigh bone, and she is looking at it from the perspective of gross morphology or general features, but she's using 3D technologies to be able to analyze the bone. Then another one who's also using 3D imaging for ancestry, but she's focusing on the skull.

One of the general areas that we're interested in for ancestry is getting a better understanding of features that characterize indigenous populations because they're highly underrepresented in terms of what we know and what we can do to able to identify peoples of indigenous ancestry, but unfortunately, they tend to be overrepresented when it comes to forensic cases, so we need better techniques to be able to more quickly identify people.

CD: If you're using a 3D technology in the course of your work, are you using that, any sort of 3D imaging to sort of recreate the bones to be able to study them, or how does the 3D technology factor into the work?

TR: Different ways depending on the students that are doing the research. Sometimes, we do produce the model, and then 3D print it, but the work that's being done now is involving producing the 3D image, and then actually analyzing it on the computer so that you don't have to produce an actual model or print of that model. It's been very interesting because there's so many software possibilities that you can use to analyze bone in completely different ways than we've ever been able to do before because you could do something like GIS, which is not normally, the geographic information system is not normally something you would think about applying to bone because normally it's

intended for landscapes, but once you've got something in a 3D environment, you can treat it as though this is topography or landscape, and you can do analyses in softwares that you would not normally be able to otherwise.

CD: I was wondering, what drives your curiosity in terms of your research?

TR: Well, I've been very interested in the human skeleton for a while now, and so that never seems to tire, I guess. I'm really interested in all of the variants that exist and why they might exist and new ways looking at that. Ultimately, for me, I like to be able to apply that knowledge to work on forensic cases to be able to help families, their loved ones return to them, to be able to figure out in cases of things like homicide, who's responsible. Not that I'm a part of that piece of the investigation, but the work that I produce helps the people who are doing the investigated side of things, figure out how that might tie into who was responsible.

CD: What would you say is the most rewarding part of your research?

TR: I guess there are a couple of things. One of the things is that application is to be able to use it to help people and to help the families get their answers, to help the legal system to get answers it needs as well to be able to bring people to justice for crimes that they have committed. In doing research, the opportunity to teach is always very rewarding, teaching the graduate students, but also, we do a lot of outreach, so teaching high school students about my field and about the human skeleton, all things we can learn, and even teaching middle school and younger kids. We have a few of those come in, and it's great opportunity to be able to share with them because everybody else's curiosity and enthusiasm also fires my own curiosity, enthusiasm, so it helps maintain and build on that.

CD: I think that you touched on this, but were you always fascinated by the human body and by bones?

TR: Well, when I was young, I think people would've thought I'd be the last person to get involved in forensic work because I was always the person that really didn't like the sight of blood or couldn't deal with anything like that, but when I got into university and discovered anthropology and discovered the human skeleton, that became a different story. Working with a human skeleton when I first started was relatively clean because it was all nice teaching and clean collections, but then I realized that I really wanted to help people, and the best way to help people, but still be interested and be able to work with a skeleton is in that forensic capacity. Things are not as clean in a forensic capacity, and there's a lot more difficult things to see, but that kind of comes along with it and is just part of the way you get the answers that are needed, so.

CD: So you really got more interested at a university level, this anthropology course.

TR: Yeah. When I first started taking anthropology and found a real interest in humans in many different ways, I was interested in all of anthropology, actually cultural side of things as well, and archeology and everything, so it took a little while to figure out that it was the skeletal stuff that I felt I would have the longest interest in and be able to sustain my interest in the longest. Also I always did kind of like biology and the medicine side of things a little bit more, so that tied in really nicely.

CD: When I was thinking about some of the work that you do, I was thinking, "Maybe you did set out to be a doctor or something," but as you were talking about you didn't like the sight of blood-

TR: Well, I did think being a doctor at some point. I thought I would like to do something that helps people, and I thought, maybe a doctor or maybe a lawyer, a psychiatrist or something along those lines. The more and more I thought about dealing with living people and all of the things that goes along with that, the less I kind of liked that idea.

CD: Yeah. I hear you. I think you touched on this a lot, but what do you feel is the biggest impact of your work?

TR: I think in terms of the application, probably being able to provide answers to families who are waiting to hear about missing family members. That's a huge impact. I've seen the people in the courtrooms. I've seen the people waiting at scenes hoping to get information, and I know how much of a difference just having an answer can make. Even if it's not the answer they wanted, at least they get some final answer that they can then begin to deal with. That's, I think, the biggest impact, yeah.

CD: I find that an interesting question because, like with yours, it seems pretty clear-cut because I think that would be, it's a huge impact, but sometimes too there's the grad-student involvement, there's the knowledge mobilization and all that, but you're the Director of the Forensics Program, so you know first-hand, that's huge, also.

TR: Yeah, all of it is enjoyable, and there's impact in many ways that you probably, I don't even realize that some things are happening, and then information is going in many directions, but the one that I can see the most obviously is the outcome of forensic cases and that sort of thing.

[theme music fades in]

CD: Coming up: women in academia.

Tracy discusses the reason why forensic science is a draw for women and girls, and also, she dispenses some advice for people who are embarking on a career in science.

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CD: I think also you touched on it before, but just, because you do a lot of outreach, that's also the impact is getting a whole new generation of young people and students interested maybe in this area specifically, but also just in science, right?

TR: That's very true because for whatever reason, forensic science does tend to be the science that women are interested in and girls are interested in. I've been asked about that question a couple of times, 'why do I think that is'? I finally came to the realization that I think it has to do with the fact that forensic science is always about a story, and girls and women really like stories, and we like to hear people's life stories, and we like to know the story that goes along with whatever. In forensic science, all that science is being put to use to help tell a story and resolve a story. It's, I think, different than a field like chemistry where maybe the story isn't as obvious.

CD: Right. That's a nice way of putting it.

Yeah. That kind of ties in nicely with my last question. This season of the podcast has been focused on women in academia, and I wondered if you have any advice for women embarking on an academic career or a career in science, or if you want to give a shout-out to a particular mentor.

TR: I actually was very lucky as I was going through my undergraduate and master's program. There were a number of really strong, intelligent, engaged women who worked in anthropology and who were so amazing that I didn't even realize how amazing they were in terms of what they were doing compared to women in other fields where they were underrepresented in other fields. Biological anthropology always had quite a number of women working in this field, so there were many mentors, but in particular, Dr. Shelley Saunders at McMaster.

CD: Is there anything else that I haven't asked or that you would like to add?

TR: In terms of, I guess, advice to anyone, women in science, I mean, there's no reason why anything should stand in your way because there are really amazing women and men out there who are interested in helping people and helping build people's careers, but if you stay with what you really enjoy, you'll find that you have that momentum to carry through the tougher parts of the process, so stick with what you enjoy, and that will take you far.

CD: That's great, because it makes me think when I was interviewing the VP of Research, he said sometimes students worry about where this might lead and, "Where might the academic path lead me," but he said, 'if you have this natural curiosity, you're doing something that you enjoy doing, that you could foresee doing because you might be focusing in on one particular question, as long as you're still, you're letting your curiosity drive you.'

TR: That's very true because anthropology is not necessarily the field people think of first when they're thinking of a career in the future. Anthropology is one of those things that has a lot of different applications, but people aren't always aware of where that job might be because they're not hiring necessarily an anthropologist for the job. I found and I've seen as well that if you stay focused in what you're interested in, you'll see those opportunities that fit your interest, whereas if you're trying for a specific job, that's a lot harder to achieve than a whole field with lots of possibilities and directions you can take, so I would agree with him.

CD: That's great. I think that pretty much covers what I was intending to ask. I wanted to thank you so much for coming in today to speak about your work.

TR: Thank you.

CD: I would like to thank everyone for listening to today's show. I would like to thank my guest, Tracy Rogers, for coming in to speak about her work in the Department of Anthropology and Forensic Science at UTM.

Thank you to the Office of Vice Principal Research for their support and for everyone who has expressed their interest in this podcast. Please feel free to get in touch with me. My contact information is on our SoundCloud page if you have feedback or if there is someone from UTM that you'd like to see featured on VIEW to the U, and also, take the time to review us on iTunes.

Lastly, and as always, thank you to Tim Lane for his tunes and support.

Thank you, and Happy Halloween.